Final Report

NASA JRI

Evaluating Extinction Values Using Wire Impactor Data

Purpose of the Study

The purpose of the study was to compare the extinctions calculated from data obtained with the Ames Wire Impactor to extinctions measured with the SAGE II satellite system. The comparison was intended to serve as a validation of the extinctions obtained using the wire impactor data. It was felt that if the extinctions obtained by the two diverse methods agreed well, it would be an indication that the number densities measured on the wires were correct.

Description of the Data

The data used in this study were obtained during the time period 1991-1997 in the Northern Hemisphere at latitudes ranging from 20 to 60 degrees north and at altitudes greater than 16 km.

Procedure for data comparison

The procedure used to carry out the comparison between AWI data and SAGE II data was the following:

First we selected the AWI samples to be considered and we obtained the particle size distribution. Next we ran a Mie Code to evaluate the extinction coefficient .

We then obtained the extinction data from the satellite using the following procedure: First we used the DAAC to download the data. We then compiled the file to read the data and finally created a readable file containing the satellite extinction data

The next step was to analyze the satellite data. We attempted to find data which were taken at the same day (time) and place (location) as the AWI measurements were taken. Since the satellite measurements and the AWI measurements were not made at the same place and time, this process generally lead to one of two different situations:
Either data from the satellite and AWI were taken on the same day (time) AND at the "same" location – "Perfect match" (Fig.1) or data from the satellite and AWI were taken on the same day (time) OR at the "same" location – " Not perfect match" (Fig.2).

In the case of a "perfect match" we collected the data in a table as indicated in Table 1.

Finally a comparison plot was generated, as indicated in Figure 3. We also created other ways of presenting the results, as indicated by the plot of SAGE extinctions vs. AWI extinctions as shown in Fig.4.

Conclusions to be drawn from these results are that the AWI extinction data are always below SAGE data. The difference between data sets varies by a factor of 3 to 5 (85% of the cases). Possible reasons for discrepancy include:

- The index of refraction used in the MIE code
- The composition of the particles after Pinatubo
- AWI number density estimate too low
- SAGE extinction values too high.

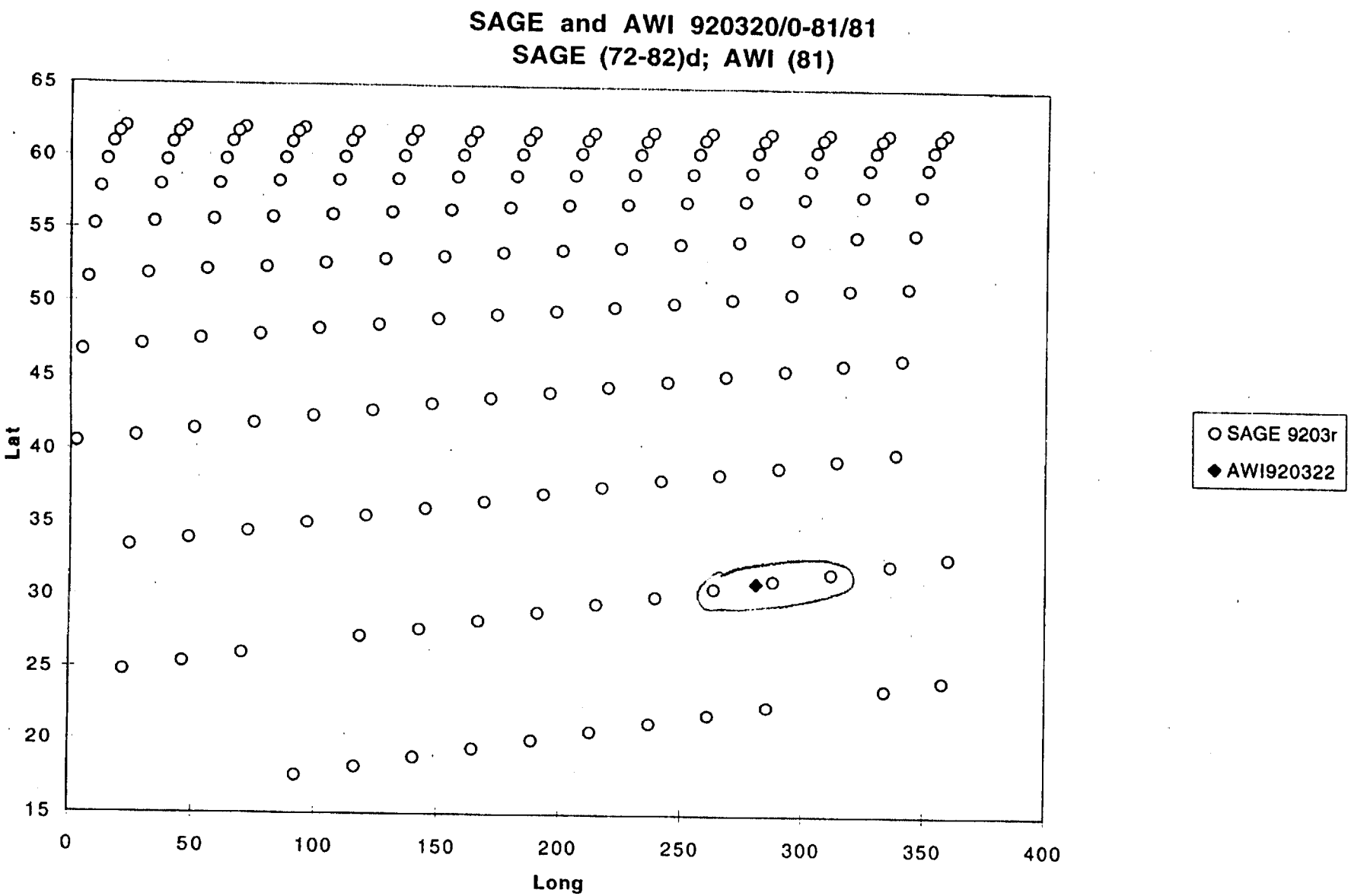

Fig 1 "PERFECT MATCH"

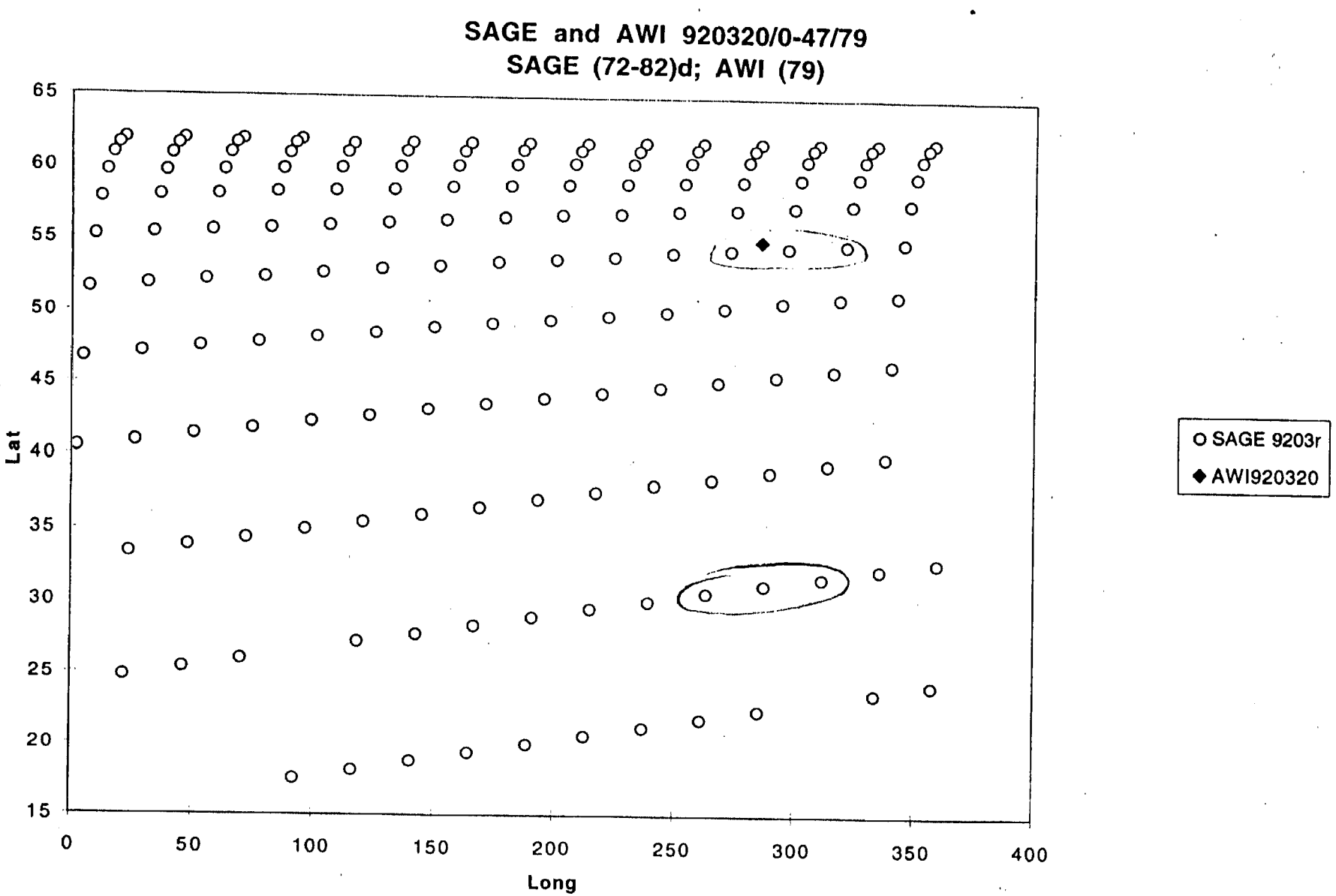

Fig. 2 NOT PERFECT IN ICE

SAGE and AWI Extinction Comparison for NH
Alt 15-20.5km, Lat 26-60, Long 230-300

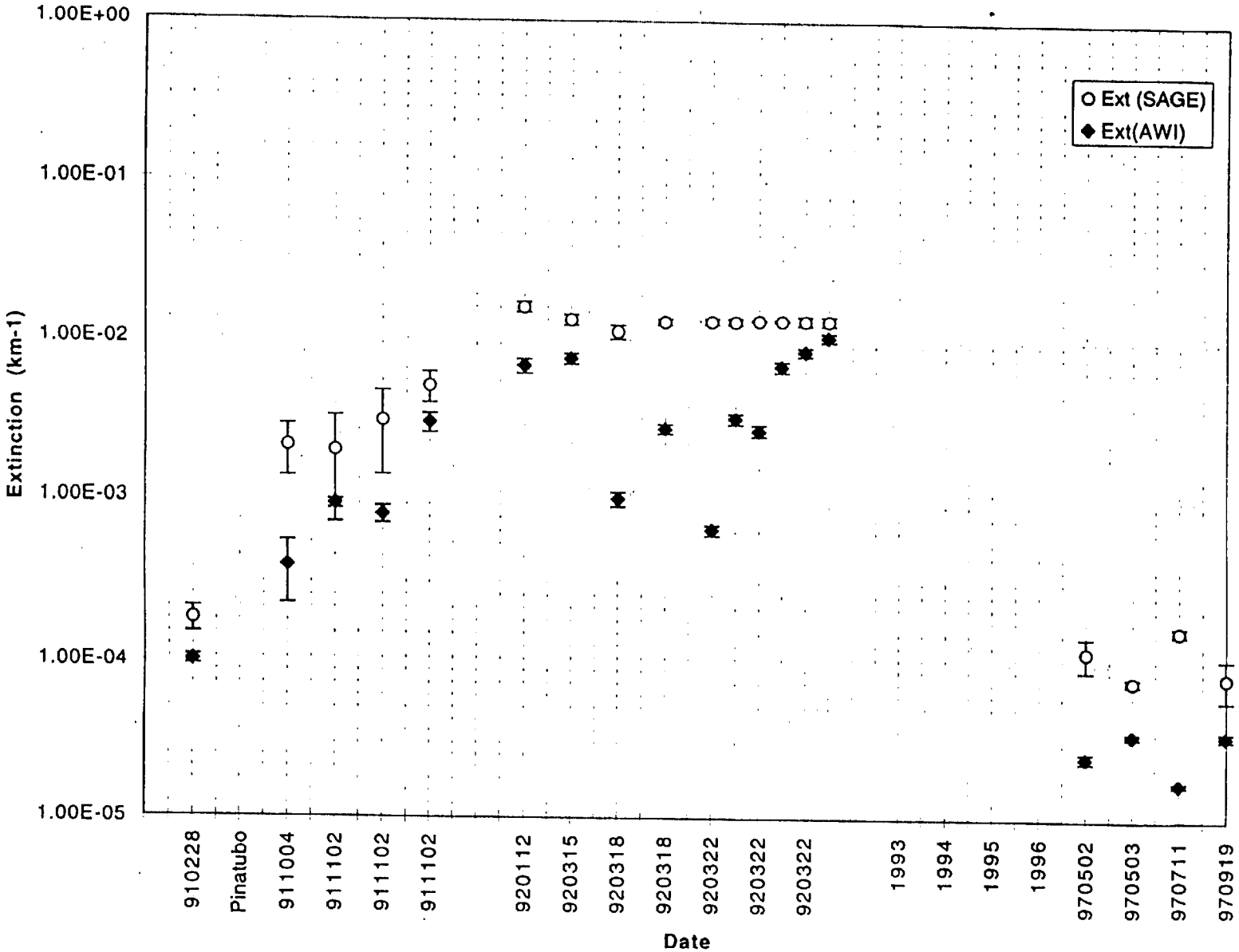

Fig 3

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Sheet13 Chart 2

SAGE Extinction vs. AWI Extinction

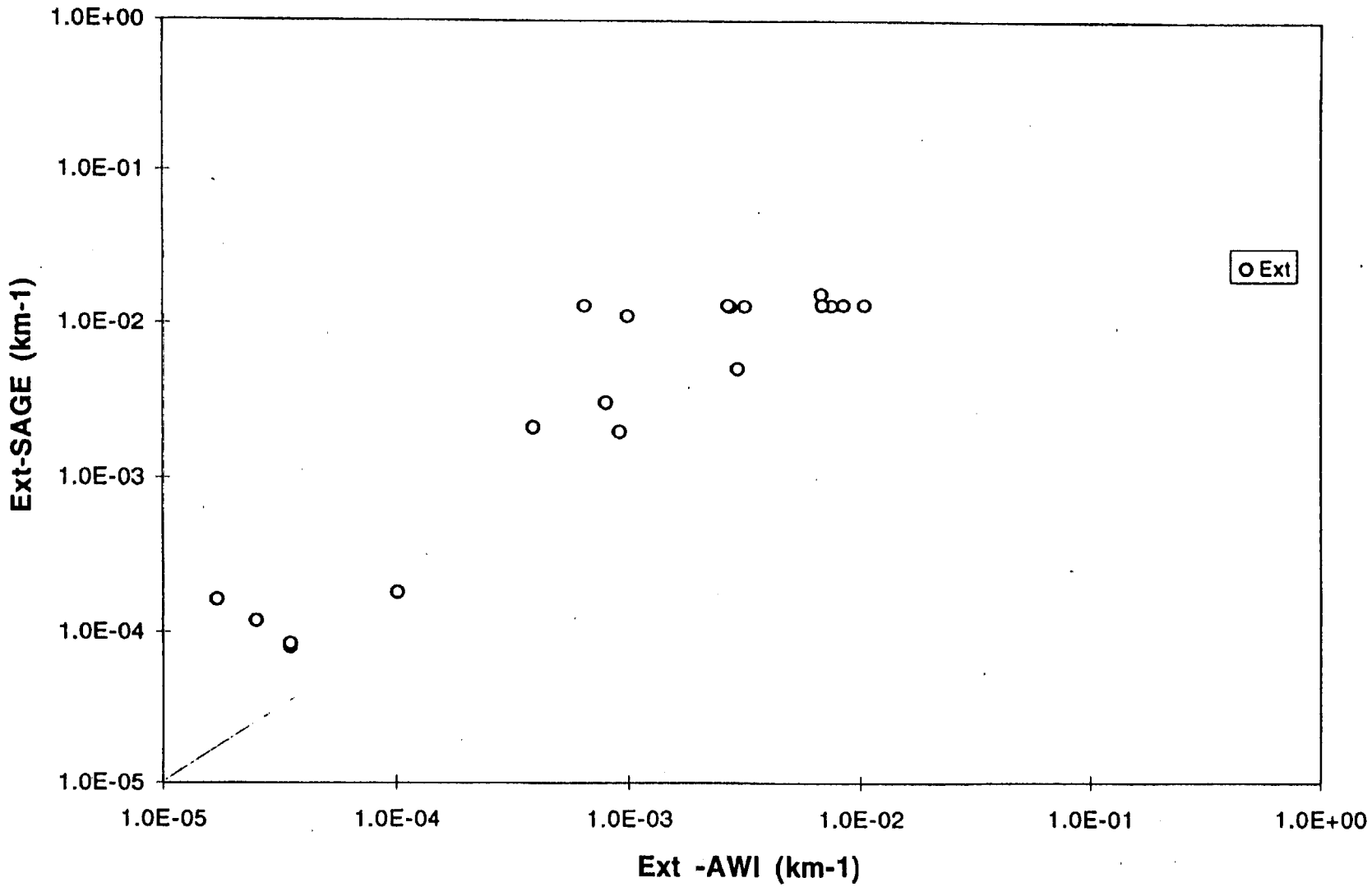

Fig 4

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SAGE and AWI Extinction Comparosin for NH

Alt 15-20.5km, Lat 26-60, Long 230-300

Date	Mission	Ring	Alt (km)	Lat	Long	Ext(AWI)	StDev(AWI)	Ext (SAGE)	StDev(SAGE)
910228 Pinatubo		L-64	15.25	37	237	1.010E-04	6.783E-06	1.830E-04	3.285E-05
911004	AASEII	305	18.6	40	237	3.860E-04	1.591E-04	2.093E-03	7.490E-04
911102	AASEII	0-62	19	41	253	9.090E-04	5.473E-05	1.967E-03	1.258E-03
911102	AASEII	0-64	19.5	41.5	270	7.920E-04	9.367E-05	3.017E-03	1.644E-03
911102	AASEII	0-66	20	43	286	2.930E-03	4.063E-04	5.023E-03	1.140E-03
920112	AASEII	0-70	19.9	36.2	292	6.760E-03	7.000E-04	1.585E-02	1.215E-03
920315	AASEII	0-93	19.76	60	303	7.510E-03	5.921E-04	1.321E-02	1.021E-03
920318	AASEII	0-97	20	54	290	9.820E-04	9.574E-05	1.111E-02	1.130E-03
920318	AASEII	0-98	19.7	58	289	2.720E-03	2.002E-04	1.292E-02	5.838E-04
920322	AASEII	0-79	20.28	37	285	6.440E-04	4.812E-05	1.305E-02	5.746E-04
920322	AASEII	0-80	20.2	34	282	3.160E-03	2.463E-04	1.305E-02	5.746E-04
920322	AASEII	0-81	20.1	31	281	2.670E-03	2.241E-04	1.328E-02	1.297E-04
920322	AASEII	0-81	20.1	31	281	6.820E-03	5.278E-04	1.328E-02	1.297E-04
920322	AASEII	0-88	19.8	26	277	8.440E-03	5.561E-04	1.327E-02	9.053E-04
920322	AASEII	0-89	19.6	26	277	1.040E-02	6.864E-04	1.327E-02	9.053E-04
970502	POLARIS	V-58	19.5	69.6	276	2.500E-05	1.690E-06	1.187E-04	2.823E-05
970503	POLARIS	V-60	20.4	70	237	3.500E-05	1.312E-06	7.900E-05	4.142E-06
970711	POLARIS	Z-26	15.5	65.2	212	1.700E-05	5.397E-07	1.641E-04	9.793E-06
970919	POLARIS	Z-48	19.2	64.5	208	3.500E-05	2.049E-06	8.387E-05	2.457E-05

table 1